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1.0 INTRODUCTION

This Engineering Exhibit was prepared on behalf of MS. LORI FORBES, to support her application for a new Class C FM radio station to serve Waimea, a small community located in the northwest portion of the Island of Hawaii, State of Hawaii. Channel 256C was originally allotted to Waimea in Docket 82-483. However, the construction permit which was eventually granted has been cancelled and the allotment process reopened.

2.0 ALLOCATION CONDITIONS

The proposed site meets all the mileage separation requirements for a Class C station as contained in Section 73.207(b)(1) of the Commission's Rules. Table I lists the channel separation distances for all applicable channels which might have an effect upon this application, based upon data as of September 5, 1991.

3.0 CLASS C OPERATING CONDITIONS

The maximum Class C operating conditions are 100 kW effective radiated power ("ERP") @ 600 meters antenna height above the average terrain ("HAAT"). This application proposes an antenna HAAT of 904 meters. Therefore, the ERP must be reduced so that the 60 dBu F(50,50) field strength contour does not extend further than 92 km. With an ERP of 38 kW and an HAAT of 904 meters, the distance to the 60 dBu field strength contour will be 91.9 km, or 92 km when rounded to the nearest kilometer.

4.0 PROPOSED TRANSMITTER SITE

The proposed transmitter site is located 0.75 km west-southwest of Kaupulehu Crater, approximately 43 kilometers southwest of Waimea, at a developed electronics site. Figure 1 shows a portion of the 7-1/2 minute Kailua, Hawaii, topographic quadrangle with the proposed site accurately plotted. Figure 2 is a 50% reduction of the entire Kailua topographic quadrangle where the proposed site is shown in relationship to the entire quadrangle.

Currently located at this site are a television station transmitter and an FM translator station:

KVHF-TV	Channel 6	Kailua-Kona
K288CS	105.5 MHz	Hawaihae

Other than the facilities of KVHF-TV and K288CS, there are no other FM transmitters or TV transmitters or any nonbroadcast radio stations within 60 meters of the site. There are no commercial or government receiving stations, cable head-end facilities or other TV transmitters within 10 km of the site. The following FM transmission facilities are located within 10 km of the site:

<u>CALL SIGN</u>	<u>CHANNEL</u>	<u>CITY OF LICENSE</u>	<u>DISTANCE</u>
KULA LIC	229C1	Kailua-Kona	0.747 km
KULA CP	230C	Kailua-Kona	0.747 km
KOAS-1	221D	Kealahou	4.284 km

The person who controls the site has agreed to the *use* of the site by the applicant as an FM transmitter site. The person who controls the site is:

Mr. Saul Levine
1500 Cotner Avenue
Los Angeles, CA 90025
(213) 478-5540

5.0 STUDIO LOCATION AND REMOTE CONTROL POINT

It is proposed to locate the studios and the *remote* control point for the transmitter at a site in Waimea, at a location yet to be selected.

6.0 EMERGENCY POWER

The applicant proposes to install emergency electrical power at both the studio and transmitter sites for continuous operation in the event of an electrical failure.

7.0 PROPOSED OPERATING CONDITIONS

It is proposed to install a **Jampro** 6-bay circularly polarized FM transmitting antenna, Type JSCP-6, having 1° of electrical beam tilt. The power gain in the main beam is 3.2 and in the horizontal plane the gain is 3.07. The antenna will be mounted on an existing 61 meter guyed steel tower directly below the KVHF-TV antenna and will have its radiation center at 35 meters above ground and 1,742 meters above mean sea level. The proposed antenna elevation is shown in Figure 3 and the vertical radiation **patten** of the proposed antenna is shown in Figure 4.

A type-approved 20 kW FM transmitter will be operated at a power output of 12.35 kW (10.92 dBk). Connecting the transmitter to the antenna will be 40 meters of 7.62 cm air dielectric coaxial cable, having an overall efficiency of 96.2%. Under these conditions the ERP in the main beam will be 38 kW and 36.5 kW (rounded to 37 kW) in the horizontal plane. The proposed operating conditions are tabulated in Table II.

8.0 PROPOSED COVERAGE

8.1 Average Terrain Data

The site elevation was obtained from the KVHF-TV data which is already on file. Terrain data was obtained from the DMA 3-second database.

8.2 Prediction of Coverage

The prediction of the 70 dBu and 60 dBu field strength contours was obtained using a computer program for propagation prediction in the FM broadcast services based upon the algorithm used by the Commission. The results of the prediction of these contours, based upon both the maximum power of 38 kW in the main beam and 36.5 kW in the horizontal plane, is shown in Table III. Figure 5 shows the 70 dBu and 60 dBu coverage contours, based upon a maximum ERP in the main lobe of 38 kW, plotted on a 50% reduction of the Hawaii, Hawaii topographic map, scale 1:250,000.

The total area enclosed within the 60 dBu contour is 5,183 square kilometers and the population within the 60 dBu contour is:

1980 Census:	33,047
1986 Update:	40,136

8.3 Citygrade Coverage

The 37⁰ radial extends through the furthestmost boundary of what is generally considered to be the community of Waimea. The distance to the 70 dBu contour along this radial is 67.1 km, while the distance to the furthestmost Waimea boundary is 42 km. Therefore, the 70 dBu contour extends 25.1 km beyond Waimea. There are no obstructions between the proposed transmitter site and Waimea which would cause a field strength level below 70 dBu over the community.

9.0 FM BLANKETING CONSIDERATIONS

The distance to the proposed 115 dBu blanketing contour is 2.43 km (1.51 miles). The area within the blanketing contour is mountainous volcanic rock and is unpopulated.

10.0 ENVIRONMENTAL CONSIDERATIONS

10.1 Section 1.1305 Considerations:

The proposed site is a developed electronic site. The antenna will be mounted on an existing tower which is only 61 meters in height and, therefore, is well below the height of 91.4 meters defined by the Commission as being a "major" environmental item.

10.2 Human Exposure to RF Radiation:

A study was made to verify that the proposed operation did not exceed the guidelines set out in FCC OST Bulletin No. 65 with respect to RF radiation exposure to humans. Since there is an existing VHF television station operating from the site its operation must also be taken into account.

10.2.1 Proposed FM Station:

The proposed operating conditions of the new station are:

MERP:	Horizontal	38 kW
	Vertical	38 kW
		<u>76 kW</u>

ANTENNA POWER GAIN: 0.035
(In a downward direction, between tower & 100 meters distance from tower)

TOTAL ERP TOWARD GROUND: 2.66 kW

ANTENNA: AGL = 35 Meters or 3,500 cm

SLANT DISTANCE: 40.3 Meters or 4,030 cm

The maximum power density of total radiation in the FM band at a point 20 meters away from the base of the tower is set at 1.0 milliwatts/cm². The equation used for this determination is equation (4) in OST Bulletin No. 65:

$$S = \frac{(0.64) \text{ ERPI}}{(Pi)R^2}$$

Where: ERPI = Total ERP, in mW x 1.64
Pi = 3.1415927
R = Distance from antenna to a point 20 meters from the base of the tower, in cm.

For the proposed operation, which assumes that the radiation toward a point 20 meters from the base of the tower is 2.66 kW or 2,660,000 mW:

$$s = \frac{(0.64)(1.64)(2,660,000)}{(3.1415927)(4,030)^2}$$

$s = 0.055 \text{ mW/cm}^2$ which is 5.5% of the maximum radiation permitted.

10.2.2 Existing Channel 6 TV Station:

The operating conditions of the Channel 6 television station, KVHF-TV, are:

ERP: 52.5 kW Visual
 6.7 kW Aural

ANTENNA: AGL = 53.3 Meters

The maximum power density of total radiation at ground level for a television station operating on TV channel 6 is set at 1.0 milliwatts/cm². The equation used in this case is equation (5) in OST Bulletin No. 65:

$$s = \frac{(2.56)(1.64)(100)(F^2)[(0.4)(VERP) + AERP]}{4(P_1)D^2}$$

Where: VERP is total peak visual ERP in watts

AERP is aural power in watts

F is typical relative field factor in downward direction (-60° to -90° elevation)

D is the distance from ground to center of radiation.

In the KVHF-TV case: VERP = 52,500 watts

 AERP = 6,700 watts

 F = 0.2

 D = 53.3 meters

 Pi = 3.1415927

$$S = \frac{(2.56)(1.64)(100)(0.2^2)[(0.4)(52500) + 6700]}{4(3.1415927)53.3^2}$$

S = 13.03 uW/cm² or 0.01303 mW/cm², which is
1.3% of the maximum radiation permitted.

10.2.3 Combined Operation:

Proposed FM Station = 0.055 mW/cm²

KVHF-TV Station = 0.013 mW/cm²

TOTAL: 0.068 mW/cm²

The combined total represents only 6.8%
of the maximum radiation permitted. Therefore, the proposed
new FM station operating along with the existing channel 6
television station is well below the maximum limit of 1.0
mW/cm² and thus exceeds the requirements of OST Bulletin No.
65 and is in full compliance with the Rules.

10.3 Occupational Radiation Hazard Plan:

The applicant, in cooperation with any other licensees and/or permittees, will establish the following procedures to reduce the exposure to excessive levels of RF radiation for those who will be working on the tower in the vicinity of the applicant's transmitting antenna.

1. Post approved "RF Radiation Hazard" signs on the tower near the climbing ladder.
2. Require workers climbing the tower, performing work for, and at the direction of the applicant, to wear an approved radiation suit, or
3. Have the work done at times of the day when the station can be shut down, or
4. Reduce the transmitter output to a level where a person can work safely in the vicinity of the antenna. In this regard, it may be necessary to have KVHF-TV also reduce their transmitter output power so that safe levels of RF energy will be experienced in the vicinity of the applicant's antenna.

APPLICATION FOR CONSTRUCTION PERMIT
FOR NEW FM STATION
WAIMEA, HAWAII

PREPARED FOR:

MS. LORI FORBES
LOVELAND, COLORADO 80538

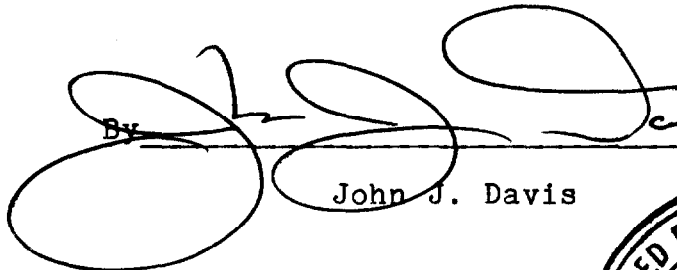
11.0

AFFIDAVIT

STATE OF CALIFORNIA)
COUNTY OF LOS ANGELES)

ss:

JOHN J. DAVIS, does hereby swear that he is a consulting electronics engineer with offices in Sierra Madre, California; that he is a Registered Professional Engineer in the State of California; that his qualifications as an expert in radio engineering are a matter of record with the Federal Communications Commission; that the foregoing engineering statement was prepared by him or under his direction; and that the statements contained therein are true of his own knowledge and belief, and as to those statements, he verily believes them to be true and correct.

By 
John J. Davis

September 20, 1991

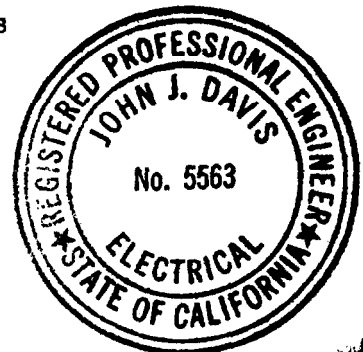


TABLE I

MILEAGE SEPARATION REQUIREMENTS

Title: WAIMEA, HI
Channel 256C (99.1 MHz)
Database: DW 09/05/91

Latitude: 19-42-56
Longitude: 155-55-00
Safety zone: 135 km

Call Auth Licensee name	Chan	ERP-kW	Latitude	Br-to	Dist.	Req.
City of License	St	FCC File no.	Freq	EAH-m	Longitude -from	(km) (km)
KSLP CP	PACIFIC STATES EDUC	*202B1	.69	35-21-38	55.8	3891 31
SAN LUIS OBISPO CA	BPED-840321	CA 88.3	413	120-39-21	252.7	3860 CLEAR
CP Granted 12/07/84; Call Granted 01/31/85						

KAN FRANCISCO CA	KQED INCORPORATED	*803B	380	122-26-23	247.0	3795 CLEAR
IDG-RENEWAL; Network: NPR AMP						

KHHH CP	KHVH INCORPORATED	253C1	60	21-18-49	311.6	269.2 105
HONOLULU HI	BPH-890519	IA 98.5	18	157-51-43	130.9	164.2 CLEAR
CP Granted 11/27/89; Affiliated with KHVH(AM)						

PRM	PROPOSED RULE MAKING	254A		38-45-12	49.2	3865 95
MIDDLETOWN CA	DOC-88-491	98.7		122-36-54	246.1	3770 CLEAR

KBQB CP	NORTH SHORE RADIO	255C1	100	22-12-25	308.1	454.6 209
PRINCEVILLE HI	BPH-900418	ML 98.9	-15	159-23-27	126.9	245.6 CLEAR
CP Granted 06/19/91 per FCC release #21147 dated 06/26/91;						
Call Granted 08/09/91 per FCC release #164 dated 08/09/91						

ALLOCA	256C	20-01-24	37.0	42.8	290
WAIMEA HI	99.1	155-40-12	217.1	-247	SHORT
COORDINATES ASSUMED; ALLOC REOPENING PER CP CANCELLATION;					
Filing window 08/30-10/03/91					

KWHZ CP	M KEITH ALLGOOD	257A	3.6	40-42-58	45.1	3840 165
FERNDAL CA	BMPH-880810	1D 99.3	124	124-12-11	241.7	3675 CLEAR
CP Granted 06/20/91 per FCC release #21152 dated 07/03/91						

KAGB CP	AGNEW-SACHS	258C1	100	21-18-02	311.3	268.5 105
HONOLULU HI	BPH-830520	AI 99.5	-117	157-51-53	130.6	163.5 CLEAR
CP Granted 12/22/86; Call Granted 03/31/87						

KFRC-FM LIC KYUU INCORPORATED	259B	45	37-41-15	51.1	3830 105
SAN FRANCISCO CA	BLH-820419	AC 99.7	378	122-26-04	247.7 3725
Was KXXX-FM 03/02/91 per FCC release #153 dated 03/08/91;					
Affiliated with KNBR(AM)					

>> End of channel 256C study <<

TABLE II

ENGINEERING SPECIFICATIONS

NEW FM STATION
CHANNEL 2566, 99.1 MHz
WAIMEA, HAWAII

a) TRANSMITTER LOCATION

North Latitude: 19° 42' 56"

West Longitude: 155° 55' 00"

Site is at an elevation of 1,707 meters AMSL, 0.75 km west-southwest of the Kaupulehu Crater.

b) STUDIO AND REMOTE CONTROL LOCATION

To be determined

c) EQUIPMENT

Transmitter: Type-Approved 20 kW

Transmission Line: Cablewave Systems, Inc. 40 Meters
Type HCC300-50J
7.62 cm air dielectric
coaxial cable
Attn: 0.423 dB/100 meters (0.169 dB)
Efficiency: 96.2%

Tower (Existing): Guyed Steel 61 Meters

Antenna: Jampro, Model JSCP-6 6 Bay

Power Gain:

Maximum: 3.20 (5.05 dB)

Horizontal: 3.07 (4.88 dB)

Beam Tilt: -1 degree

Null Fill: None

TABLE II

d) HEIGHTS

	<u>Meters</u>
Height of Site Above Mean Sea Level (AMSL):	1,707
Height of Tower Above Site (AGL):	61
Overall Height of Tower AMSL:	1,768
Height of Average Terrain AMSL:	838
Height of Site Above Average Elevation:	869
Effective Height of Antenna Above Site:	35
Effective Height of Antenna AMSL:	1,742
Effective Height of Antenna Above Average Terrain (HAAT):	904

e) PROPOSED OPERATION

Transmitter Power Output (TPO):	12.35 kW	
Transmission Line Loss (96.2%):	0.47 kW	
Antenna Input Power:	11.88 kW	
	<u>MAIN BEAM</u>	<u>HORIZONTAL</u>
Antenna Gain:	3.2	3.07
Effective Radiated Power (ERP):	38.0 kW	36.5 kW (37.0 kW*)

* - Rounded to the nearest kilowatt

TABLE III

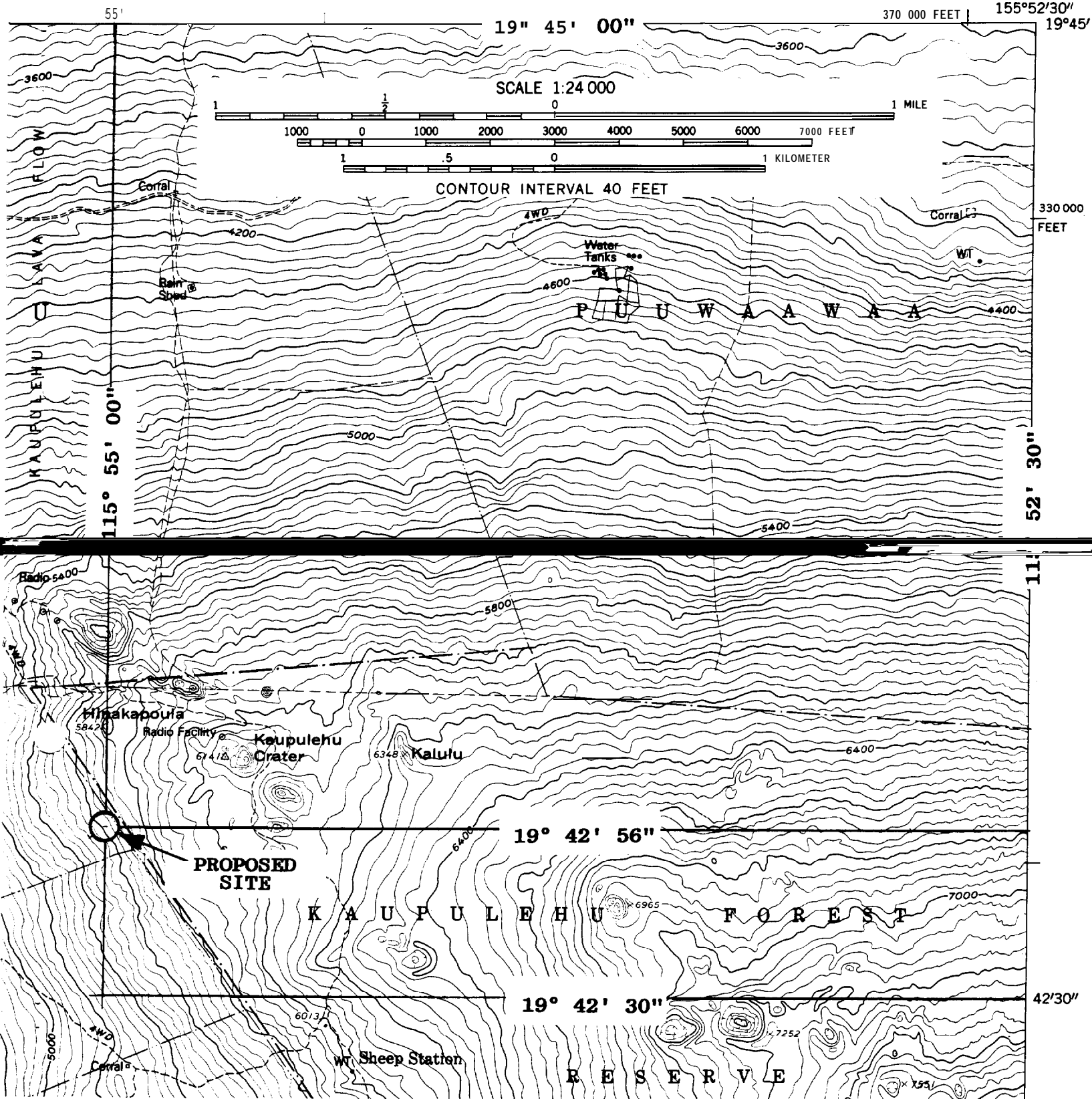
TERRAIN & COVERAGE DATA

BEARING (Degrees)	ANTENNA HEIGHT ABOVE AVERAGE TERRAIN (Meters)	DISTANCE TO CONTOURS			
		70 dBu		60 dBu	
		MAX. (km)	HOR. (km)	MAX. (km)	HOR. (km)
0	1,300	74.3	73.9	99.7	99.2
10*	1,242	73.4	72.9	98.8	98.3
20*	1,169	72.2	71.7	97.6	97.1
30*	1,022	69.5	69.1	94.7	94.2
37**	907	67.1	66.7	92.0	91.6
40*	906	67.1	66.7	92.0	91.6
45	842	65.5	65.1	90.2	89.8
50*	764	63.2	62.8	87.8	87.4
60*	610	58.0	57.6	82.4	82.0
70*	470	50.9	50.6	74.7	74.2
80*	318	42.7	42.4	63.9	63.5
90	134	29.0	28.7	47.5	47.1
100*	-91	14.0	13.9	24.9	24.7
110"	-301	14.0	13.9	24.9	24.7
120*	-300	14.0	13.9	24.9	24.7
130'	-164	14.0	13.9	24.9	24.7
135	-61	14.0	13.9	24.9	24.7
140*	42	16.6	16.4	28.8	28.6
150*	233	37.6	37.3	57.6	57.3
160*	403	47.3	46.9	69.8	69.4
170*	596	57.5	57.1	81.8	81.4
180	804	64.4	64.0	89.1	88.7
225	1,445	76.5	76.1	101.6	101.3
270	1,444	76.5	76.0	101.6	101.1
315	1,324	74.7	74.2	99.9	99.6
AVERAGE:	904			91.9	

NOTES:

1. MAX. - Maximum radiation in main lobe, ERP = 38 kW
2. HOR. - Radiation in the horizontal plane, ERP = 36.5 kW
3. Antenna height above the average terrain based upon an antenna height of 1,742 meters AMSL.
4. * - Not included in average
** - Radial through Waimea, not included in average.

KAILUA QUADRANGLE
HAWAII-HAWAII CO
ISLAND OF HAWAII-NORTH KONA DISTRICT
7.5 MINUTE SERIES (TOPOGRAPHIC)



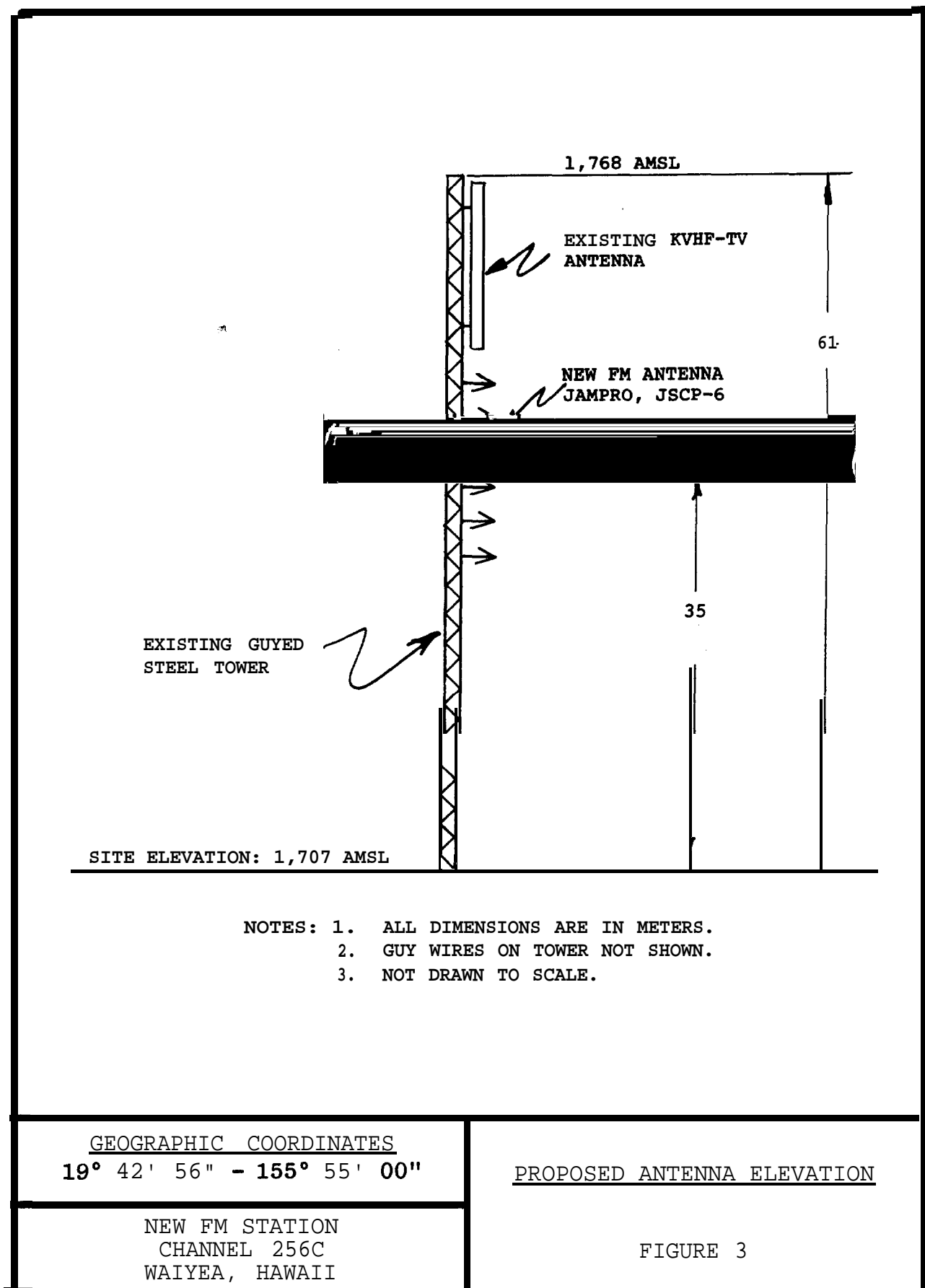
USGS TOPOGRAPHIC 7½-MINUTE QUADRANGLE
KAILUA, HAWAII

JOHN J. DAVIS
CONSULTING ENGR.
SIERRA MADRE, CA

NEW FM STATION
CHANNEL 256C
WAIMEA, HAWAII

PROPOSED SITE

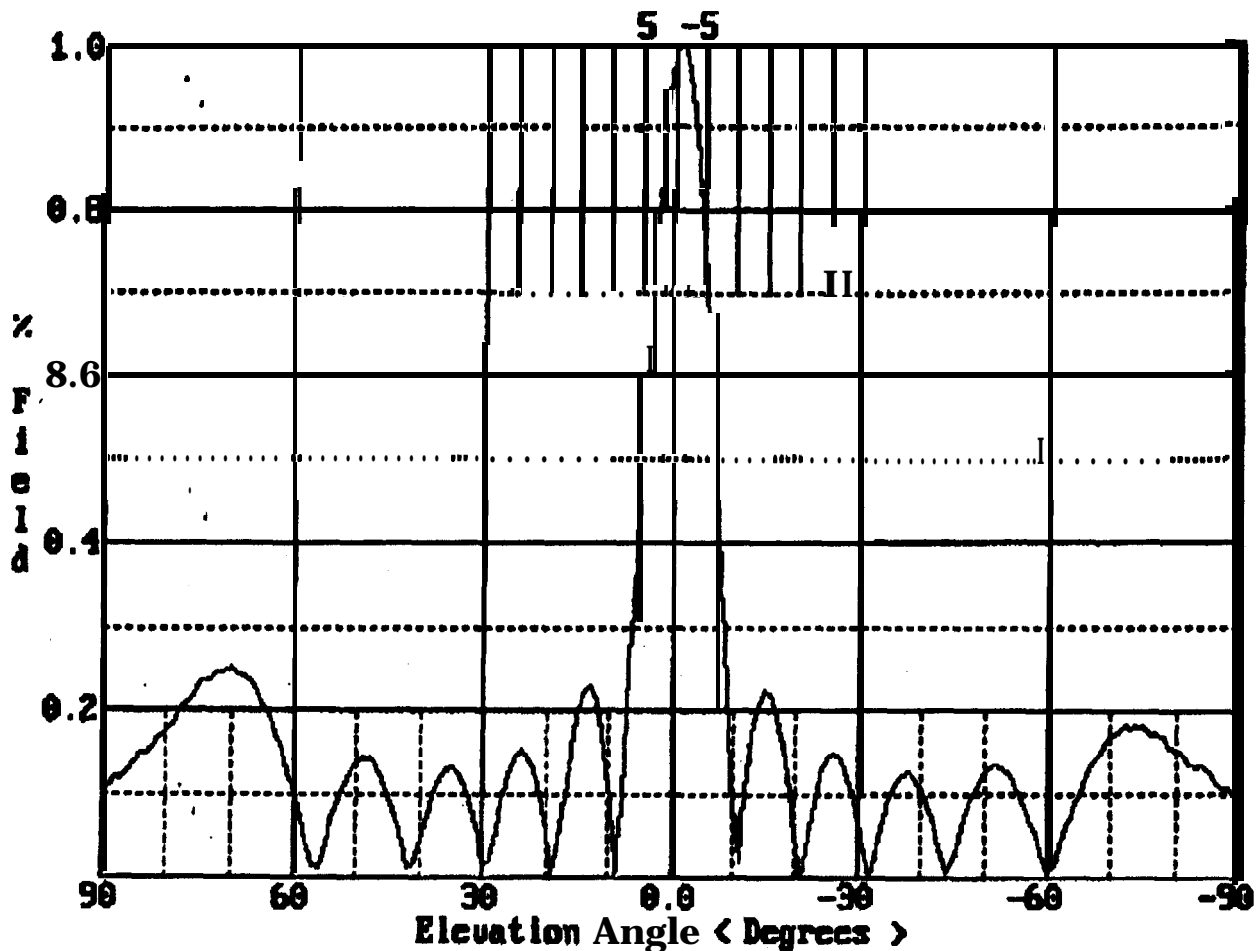
FIGURE 1





ANTENNA VERTICAL RADIATION PATTERN

ELEVATION PATTERN



JSC-P-R-Q A-T-E-N-T-A-S

Customer: WAIMEA. HAWAII **date:** 09/20/91

Frequency: 99.1 MHz **Type:** JSCP-6

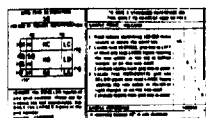
bays: 6 **spacing:** 1.0 WAVE **gain:** 3.2

Beam tilt: -1.0 DEGREES **Null fill:** 0 %

Notes: Elevation pattern plotted in relative field

forbes:910920A

FIGURE 4



FORBES
910920A

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

KAILUA QUADRANGLE
HAWAII-HAWAII CO
ISLAND OF HAWAII-NORTH KOHA DISTRICT
7.5 MINUTE SERIES (TOPOGRAPHIC)

